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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/517,314	03/02/2000	Chih-Chen Cho	M4065.0223/P223	5039

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EXAMINER

KANG, DONGHEE

ART UNIT PAPER NUMBER

2811

DATE MAILED: 04/09/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/517,314

Applicant(s)

CHO, CHIH-CHEN

Examiner

Donghee Kang

Art Unit

2811

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3-11,13-17,25,27-32 and 39 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 11,13-17,25,27-32 and 39 is/are allowed.
- 6) ☒ Claim(s) 1, and 3-10 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Acknowledgment

1. Applicant's amendment and response have been entered and made of record.
Claims 1, 3-11, 13-17, 25, 27-32 & 39 are pending in this application.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claim **1, 3, & 9-10** are rejected under 35 U.S.C. 102(b) as being anticipated by Chiang et al. (US 5,739,579).

Re claim **1**, Chiang et al. teach a semiconductor device comprising (Figs.1-9):

an insulator layer (22); a conductive plug positioned within said insulator layer and formed of a single conductive material (Col.8, lines 37-43); a doped region (21) connected to said conductive plug; an etch-stop layer (23) located on said insulator layer and surrounding said plug; a non-conductive layer (50, fig.5) having an etched via (51) formed at least partially over said conductive plug, wherein said etched via is wider in diameter than said conductive plug; and a conductive connector formed in said via in electrical contact with said plug and including a first conductive layer (60) deposited in and in contact with said etched via and a second conductive layer (61) deposited over and in contact with said first conductive layer, said first conductive layer including a portion in contact with said conductive plug.

Re claim **3**, Chiang et al. teach said etch-stop layer comprises silicon nitride (Col.8, lines 10-17).

Re claim **9**, Chiang et al. teach said first conductive layer comprises titanium nitride (Col.8, line 51).

Re claim **10**, Chiang et al. teach substrate with a connection region, wherein said conductive plug is provided over said connection region.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 4 & 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiang et al. (US 5,739,579).

Re claim 4, Chiang et al. do not explicitly teach the etch-stop layer comprising silicon carbide. However, Chiang et al. noted in alternate embodiment that the etch-stop layer may include any suitable material, including silicon nitride or silicon carbide (Col.14, line 65 – Col.15, line 3). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the silicon nitride with silicon carbide since silicon nitride and silicon carbide would work equally well as an etch-stop layer for BPSG dielectric layer.

Re claims 7-8, Chiang et al. do not explicitly teach the non-conductive layer comprising borophosphosilicate glass (BPSG). However, Chiang et al. noted in

alternate embodiment that dielectric layer may include any suitable dielectric material, including silicon dioxide (SiO_2) or BPSG (Col.15, lines 37-45). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the silicon dioxide with BPSG since silicon nitride and BPSG would work equally well as an inter-dielectric material.

6. Claim **5-6** are rejected under 35 U.S.C. 103(a) as being unpatentable over Chiang et al. in view of Wang (US 6,184,128).

Re claim **5**, Chiang et al. do not explicitly teach the etch-stop layer comprising silicon dioxide. Wang teaches in Fig.7 the silicon dioxide layer acts as an etch-stop layer (Col.5, lines 49-64).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to substitute the silicon nitride of Chiang with a silicon dioxide as taught by Wang in order to provide the etch-stop layer in Chiang's device. Furthermore, one of ordinary skill in the art would have recognized that the silicon nitride and silicon dioxide are both considered to be an art recognized functional equivalent for serving as an etch-stop layer for BPSG dielectric layer.

Regarding claim **6**, Chiang et al. do not teach the non-conductive layer (etch-stop layer) comprising silicon nitride and silicon carbide. However, Wang teaches in Fig.7 the etch-stop layer including the silicon nitride and silicon carbide layer (Col.5, lines 49-64). It would have been obvious to one of ordinary skill in the art at the time the invention

was made to substitute the silicon nitride of Chiang with a silicon nitride and silicon carbide as taught by Wang in order to provide the etch-stop layer in Chiang's device.

Moreover, it would have been obvious to one of ordinary skill in the art to form the etch-stop layer using silicon nitride and silicon carbide stack layer as taught by Wang, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as matter of obvious design choice. In re Leshin, 125 USPQ 416.

Allowable Subject Matter

7. Claims 11, 13-17, 25, 27-32, & 39 are allowed.

Conclusion

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Donghee Kang whose telephone number is 571-272-1656. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C Lee can be reached on 571-272-1732. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should

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you have questions on access to the Private PAIR system, contact the Electronic
Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Donghee Kang".

Donghee Kang
Examiner
Art Unit 2811

dhk